

Cloud Ice Radiometry at Submillimeter Wavelengths

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Cloud ice radiometry is a new technique for characterizing and monitoring the properties of middle- and upper-tropospheric ice clouds. Passive radiometric measurements at submillimeter-wavelengths (frequencies above 300 GHz) can be used to retrieve integrated ice mass, determine the median crystal size, and constrain crystal shape. A submillimeter-wave radiometer could provide a valuable complement to a spaceborne radar. The radiometer would constrain particle size and, thereby, improve the accuracy of radar-derived ice mass profiles.

An advanced airborne submillimeter-wave radiometer being developed to validate this technique is nearing completion. Next fall, this radiometer will fly on the NASA DC-8 along with multiple cloud sensors including a 94-GHz radar. The planned measurement program in conjunction with the ongoing theoretical modeling effort will validate the use of cloud ice radiometry to retrieve ice mass and crystal size. In the future, this radiometer will be available to support airborne science programs and assist in validation of CloudSat.

Successful demonstration of cloud profiling with a submillimeter-wave cloud ice radiometer and a millimeter-wave radar will represent a major advance for future cloud and radiation science missions.